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A simple nutrition screening tool for hemodialysis nurses

Abstract

Objective: To assess the reliability of a nurse-performed nutrition screening tool (NST) for hemodialysis (HD) patients in order to identify nutritionally at-risk patients.

Design: Tool reliability assessment. Setting: 9 non-hospital private (n=3) and public (n=6) hemodialysis units in Australia (2 rural and 7 metropolitan)

Participants: 112 hemodialysis patients Main Outcome Measures: Sensitivity and specificity. Results: 112 HD patients (m=65, f=47) from 9 non-hospital HD units in Australia (7 metropolitan and 2 rural) were screened with the NST and the outcome of dietitian referral compared with Standard Dietitians Assessment. Mean age of patients was 57.6 years. Overall, the NST showed sensitivity of 0.84 (0.71, 0.94 p<0.05) and a specificity of 0.9 (0.82, 0.98 p<0.05). The NST was more sensitive (sensitivity 0.93 (0.87, 0.99 p<0.05)) and more specific for males (specificity 0.92 (0.85, 0.99 p<0.05)). Specificity was very strong in metropolitan patients (specificity 0.94 (0.87, 1.01 p<0.05)). Conclusion: The tool was more sensitive and specific than the NST previously reported by the same authors. The tool is particularly specific in that it screens those patients NOT requiring dietitian intervention. The use of this tool may benefit hemodialysis units that do not have on-site or regular dietetic support to prioritise patients needing dietitian intervention.

Key Words: nutrition, screening tool, dialysis, hemodialysis, nursing
Introduction

As people with end stage renal disease (ESRD) progress towards renal replacement therapy (RRT) there is often a multifactorial decline in nutritional status. \(^1-^3\) Once on RRT the incidence of protein energy malnutrition (PEM) in dialysis patients is exacerbated by uremia, the need for dietary restrictions for potassium and phosphate, as well as by the hemodialysis process itself. Research and clinical observation suggests that nutritional status often improves with the commencement of dialysis; however poor nutritional status in maintenance hemodialysis patients is still prevalent. \(^1-^4\)

Nutrition screening has been shown to assist in the early recognition and response to nutritional problems resulting in improved health outcomes. \(^5^6\) An important differentiation of terms needs to be acknowledged when discussing screening tools as opposed to assessment tools. A screening tool is a series of questions which results in a qualitative definition or quantitative score. This can be used to draw attention to a person who may need a referral to, in this case, a dietitian. In contrast a nutritional assessment tool is a tool used to measure the nutritional status of the participant. \(^7\)

Nutrition screening is a simple and rapid process by a clinician other than a dietitian to identify those at risk of nutrition related problems. Those identified at risk can then be referred to a dietitian for a comprehensive nutritional assessment. \(^4\) Nutrition screening has other potential benefits including raising the profile of dietitian services,
increasing nutrition awareness amongst nursing and medical staff and cost saving from earlier nutrition interventions. 

In Australia over the past 5 years there has been a significant increase in the non-hospital satellite hemodialysis population. The increased remoteness of the satellite centres from the patients’ parent hospitals has distanced the patient from hospital dietitian services. Thus, a tool that could assist the nurse to make an appropriate dietitian referral was considered useful for managing the dietitian workload.

Although there has been a focus on malnutrition screening tools in recent times, our group was interested to screen the specific nutritional concerns that affect non-hospital hemodialysis patients. These include markers such as phosphate and potassium. From this perspective our group developed a nutrition screening tool (NST) that has been shown to be simple and easy to use by nursing staff. The original tool consisted of 9 screening elements: body mass index, weight change, poor appetite, gastrointestinal symptoms, albumin, pre-dialysis urea, pre-dialysis serum potassium, pre-dialysis serum phosphate and glycosylated hemoglobin. The 9-element tool was used for screening and compared with a Standard Dietitians Assessment previously. Analysis of this data showed that the 4 items displaying the highest alpha reliability coefficient were weight change, poor appetite, serum potassium and serum phosphate. Thus these were the items chosen to be included in the NST for this study (Table 1).
Methods

The participants were recruited from 9 different non-hospital hemodialysis units from 3 different states of Australia. Participating dialysis units volunteered following national expressions of interest. Therefore, the only criteria for subject selection was that they were a haemodialysis patient in a non-hospital dialysis unit participating in the study. All patients dialysing in these units were invited to participate. All participants were receiving either 3.5 to 5.5 hours of hemodialysis or hemodiafiltration 3 times per week.

Participants were required to give their fully informed consent prior to participating in the study. Following this an education session for the participants and the nurses was undertaken.

The nutrition screening was performed by clinical nurses as part of routine clinical care. The nurses screened subjects utilizing the NST and within 2 weeks a trained dietitian completed a full Standardized Dietitian Assessment (SDA)\textsuperscript{13} on the same patient. The SDA included all aspects of normal dietitian clinical assessment such as anthropometry, biochemistry, medications, clinical issues, psychosocial issues and diet history. The SDA was considered the most complete nutritional assessment in comparison to other nutritional assessment tools such as SGA. If a nurse’s screening identified 1 or more of the 4 risk factors the participants were considered nutritionally at risk by the NST. If the NST was valid then there would be agreement between the NST and SDA regarding the need for dietitian intervention.
Statistical analysis of the data was performed using SPSS® software. 2x2 frequency tables were used to assess the reliability elements of sensitivity and specificity. Sensitivity was defined as the proportion of individuals who were correctly identified as being nutritionally at risk and specificity was defined as the proportion of individuals who were correctly identified as not at risk.

Results
117 participants were commenced in the study. 5 participants were excluded from the study due to incomplete data. 112 participants (m=65, f=47) from 9 satellite HD units from three separate states in Australia (South Australia (n=77), Northern Territory (n=18) and Queensland (n=17)) were screened with the NST and then compared with SDA. The participants were dialyzing at 7 metropolitan dialysis units (77 participants) and 2 rural units (35 participants). 6 dialysis units were Public Hospital affiliated and 3 were private units. Mean age of participants was 57.6 years. Data relating to causes of renal failure and current comorbidities was not collected.

The NST correctly classified 88% of participants. 12% were incorrectly classified (Table 2). The NST showed sensitivity of 0.84 (0.74, 0.94 p<0.05) and specificity of 0.9 (0.82, 0.99 p<0.05). The NST was more sensitive (sensitivity 0.93 (0.87, 0.99 p<0.05)) and more specific for males (specificity 0.92 (0.85, 0.99 p<0.05)) (Table 3). Hence, sensitivity (0.72 (0.54, 0.98 p<0.05)) and specificity of females (0.91 (0.81, 1.01 p<0.05)) was lower. Although numbers were slightly smaller specificity increased when analyzing the metropolitan participants alone (specificity 0.94 (0.87,
1.01 p<0.05)) (Table 4). Thus, specificity and sensitivity were less for non-metropolitan participants.

**Discussion**

Our group concurred with Gower\(^\text{13}\) and Oakley and Hill\(^\text{15}\) in validating the NST against a standardized dietitian’s assessment (SDA). Among the 112 participants the tool has correctly identified their need for referral 88% of the time when compared with an SDA. Sensitivity is 0.84 (0.71, 0.94 p<0.05) and specificity is 0.9 (0.82, 0.98 p<0.05). Although the validity of the results of the NST have to be considered in the context of the screening process\(^\text{16}\) it is important to note that 88% of participants were correctly classified by the NST when compared to the dietitian’s SDA. In saying this, the acceptance by clinicians of screening tools and validity thresholds can be an individual preference.

The validation of this tool was performed in non-hospital dialysis clinics. In these clinics dietitian services are shared. Thus, a dietitian is not always able to frequently assess or provide prompt intervention to every haemodialysis patient. The 4 question tool has a sensitivity of 0.84 (0.71, 0.94 p<0.05) which means in 84% of all cases the tool will correctly recognise that a person on hemodialysis is nutritionally at-risk for the parameters assessed. In addition, the specificity is 0.9 (0.82, 0.98 p<0.05) or the tool will correctly recognize 90% of all cases that ARE NOT nutritionally at-risk as described by the SDA. On further analysis of the data the tool had improved sensitivity and specificity in the male participant population 0.92 (0.85, 0.99 p<0.05) and the metropolitan population 0.94 (0.87, 1.01 p<0.05). While this may be
significant it is well worth noting that this suggests a poorer sensitivity and specificity among female participants.

Nutrition screening tool validity assessment is fundamentally problematic due to the lack of a gold standard determination of nutritional status.\textsuperscript{16} This is further complicated by the particular nutrition issues that are unique to the person undergoing maintenance hemodialysis. Given that this tool was screening for other significant at-risk parameters, the use of “malnutrition” gold standards for testing validity may be problematic.

Previously reported nutritional assessment tools such as modified subjective global assessment (SGA) for renal patients\textsuperscript{10,17} have been shown to be reliable in identifying malnutrition in the dialysis patient. However there continues to be debate as to the usefulness, validity and best version of the SGA to use, and the validity of SGA in populations other than the original study populations.\textsuperscript{18} Our study was not attempting to assess malnutrition per se. Rather, our tool was attempting to identify patients who were at-risk and who required dietitian referral and intervention. The same criticism could be given to our tool in that it should only be considered valid in our study population (Australian non-hospital adults undergoing haemodialysis or hemodiafiltration) until further validation is completed.

The NST phosphate cut off was set at 2.0mmol/L as this was the recommended maximum at the time of screening. Since the data collection, revised K/DOQI clinical practice guidelines for bone metabolism and disease in Chronic Kidney Disease have recommended target serum phosphate levels less than 1.78 mmol/L.\textsuperscript{20} As the revised
target is the same for the dietitians SDA and NST, modifying the NST to reflect this change should have minimal impact on it’s reliability.

The potential for improved clinical outcomes by screening nutritionally at risk hemodialysis patients may be assisted by the use of screening tools. Previous research findings have recommended screening tools because nurses do not make the same interpretation of nutritional status as dietitians. Thus, this tool may have an important place in the screening of at-risk hemodialysis patients to assist the referral process to renal dietitians for nutrition education and other interventions.

Conclusion
The author’s conclude that both the process of nutritional tool development and validation can assist in the nutritional care of the non-hospital hemodialysis patient. This paper has described an NST with potentially clinically acceptable sensitivity and specificity results. The tool reported in this study is particularly specific in that it screens those patients NOT requiring dietitian intervention. In addition the NST identified at-risk males in HD satellite units and at-risk HD patients from metropolitan HD satellite units.

Recommendations
The authors of this study recommend that this tool be used in satellite hemodialysis units who have limited access to dietetic services. In addition the authors recommend that further validation be performed in other groups such as peritoneal dialysis recipients and hospital hemodialysis recipients. Further reliability testing of this tool
is recommended. Recently revised K/DOQI clinical practice guidelines for bone metabolism and disease in Chronic Kidney Disease recommend target serum phosphate levels less than 1.78 mmol/L. \(^{20}\) Therefore the NST should be modified to reflect this change. Finally, the authors wish to note that the tool may be valuable in identifying nutritionally at risk long-term hemodialysis patients. Further research is recommended in this area.
Reference List
